

SAFER AND HEALTHIER TO SCHOOL – THE SLOVENIAN APPROACH

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ABSTRACT

An estimated 1,3 million people are killed each year on the roads worldwide and 50 million injured. That corresponds to 3,000 fatalities every day, including 500 children. This is unacceptable and urgent approach has to be made in all of 5 pillars of UN Decade of Action for Road safety to assure Safe Travel for all.

In Slovenia children safety on roads is improving, but still actions has to be taken, especially around Schools and School paths to provide safer and healthier travels, and promote walkability (also usage of bicycles as mean of transport) according to Sustainable Development Goals (SDGs).

As prompt actions need to be taken, to combat bad spatial planning decisions in the past (Schools and School paths beside roads and traffic), Slovenian Infrastructure Agency decided to draw up guidelines for infrastructure (contra) measures how to implement an immediate and cost effective solutions on the infrastructure (roads), for reducing traffic speed and rise drivers' attention, and with that assure better safety for School Children, by using Human Factors knowledge in Road (re)Design.

In this paper Slovenian approach will be discussed, how safer road re-design was introduced, from a Pilot Project on Municipality road, to wider usage on national roads, with drawing up of guidelines "Safer to School".

1. THE CONCEPT IDEA

In Slovenia, we do not have yet a harmonized strategy and with that a directive, guidance or guidelines, how to deal with school paths and vicinity of schools alongside roads (consequence of poor spatial planning and land use / urbanism), to ensure effective and uniform solution for traffic calming and enhancing driver attention, to be more attentive on children in traffic. Yet, the idea for the solution, came from working in World Road Association – PIARC, as a member of Road Safety committee true the years. The idea came from presentation at international PIARC seminar in Cape Town, South Africa, where Mr. Philip Vaneerdewegh from Belgian Road Safety Institute, presented a presentation with the title: "Improving Road Safety of Vulnerable Road User on Belgian Highways" and the "Octopus-project", which visually accentuates the School area to the road users.

Because of that, two Pilot projects were carried out, one on municipality road and one on a state road, to test two hypothesis:

1st hypothesis: Does the colourful road design, around Schools, has any effect on drivers to reduce the speed?

2nd hypothesis: Do drivers in the area of colourful road design pay more attention to what is happening on or alongside the road?

2. PILOT PROJECTS

The aim was to design, make and to introduce low cost solution (prompt measure), without construction intervention, using good practice from abroad and Human Factors knowledge in Road Design, and with that improve road safety from the 2nd (infrastructure) pillar of UN Decade of Action for Road Safety.



“Figure 1 – Slide from the presentation of »Octopus-project«”

2.1. Pilot project – municipality road

The aim of the project was to make safe(er) School and Kindergarten area on municipality road by introducing Human Factors in to the road re-design. The pilot project was to learn how to deal with those kind of problems (linear settlements and schools alongside roads) and find potential defectiveness and consequently find improvements.

Location, suitable for pilot project, was defined together with Municipality Žalec. As majority of schools are situated in urban areas with traffic calming measures and reduced speed limit “Zone 30”, we defined School and Kindergarten Trje, to be most appropriate for the project, as it is outside urban area, with set up speed limit of 50 km/h.



“Figure 2 – Location of School and Kindergarten alongside municipality road”

First information was gathered from school, where pupils actually walk. After receiving all the information, designing of the solution took place in the way, that road will “talk to drivers” by its design – “be aware of children”. Information signs and markings were designed, in user-friendly way, to talk to drivers and stimulating them to be more attentive of children on the road and at the same time encourage them to drive with more caution.

In close vicinity of School and Kindergarten junction, where there are also bus-stops and a pedestrian crossing, special totems were set up and colourful bollards.



“Figure 3 – Colourful bollards with School and Kindergarten in the background”



“Figure 4 – Totem with colourful bollards”

Traffic signage, urban equipment and markings were carefully designed and put into place considering the road alignment and roadside environment. All equipment (especially bollards) was carefully chosen, so that in the case of impact they do not pose additional threat to road users. Passive safety is also important when designing this kind of safety solutions.

In addition self-explanatory information signs were set up at the beginning from each direction of travel towards the School and Kindergarten. From information signs, all the way to the School and Kindergarten, where pupils walk to and from School and kindergarten children take their daily stroll, colourful circles, with additional anti-skid elements, were marked on the pavement, as shown in figure 6. Circles were separated apart (raster / distance between them), so that children could not play on the pavement, by jumping from one circle to another.



“Figure 5 – Self-explanatory sign addresses drivers to slow down”



“Figure 6 – Colourful circles on pavement, with red »entrance-gate« before junction to School and Kindergarten”

Also red colour surfaces (“entrance-gate”) before the junction were applied and pedestrian crossing was made on blue contrast surface (figure 6 and 7). Existing traffic signs were replaced with new ones and repositioned on more suitable locations. Also some traffic signs (for pedestrian crossing and bus-stop) were made with yellow fluorescent background, to be more conspicuous.



“Figure 7 – Pedestrian crossing on blue contrast and new traffic sign”

The overall costs for the pilot project were high, as a lot of man hours went in (brain storming and finding right solutions, including some tests before implementation and design, work and material), so overall costs for designing and implementing the projects are estimated on 37.582,71 EUR.

2.1.1 *Monitoring results*

The design was very well accepted among children, parents, teachers, local community and drivers. The idea behind the design and its purpose was to alert drivers, to properly stimulate them to be more attentive for children presence and to reduce speed.

Speed monitoring (before/after) was carried out, with traffic and speed counter ViaCount II, before the project implementation:

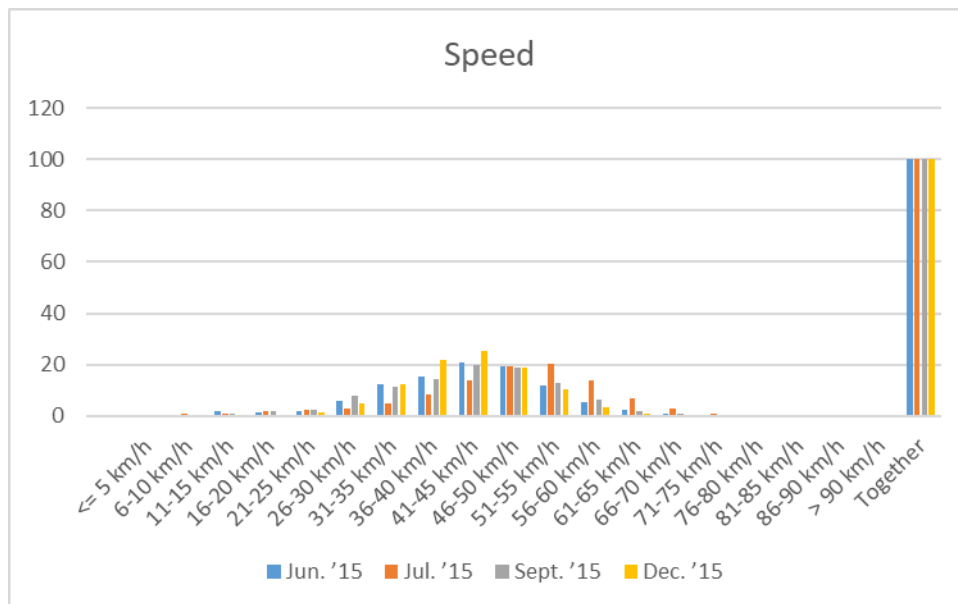
- June '15 (during School),
- July '15 (School-brake),
- September '15 (beginning of School),

and after the project implementation:

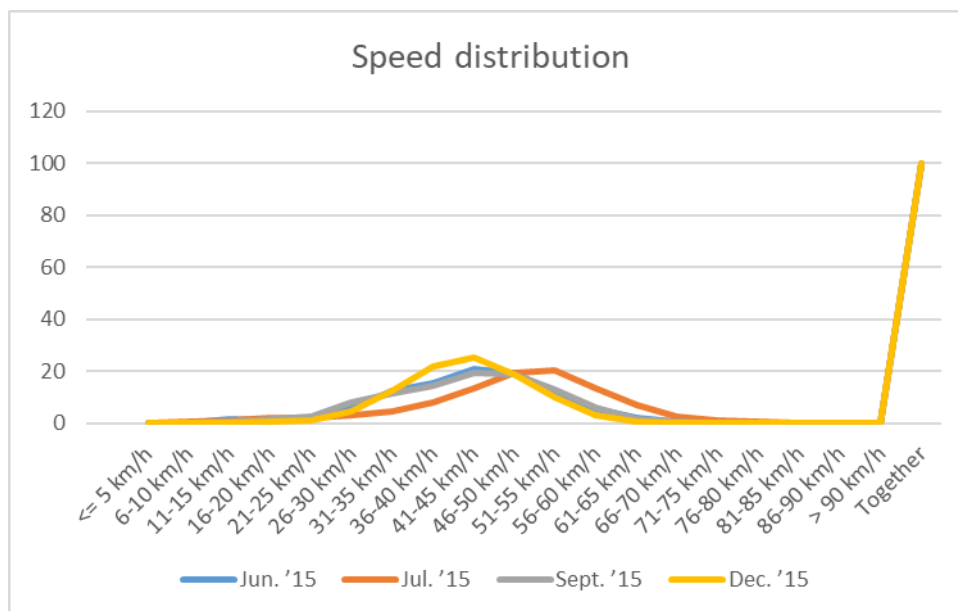
- December '15 (during School).

Monitoring was done in similar weather and road conditions, so the weather and the road surface did not affect the driving speed.

When analysing the speeds, we find, that after the project implementation, speeds (V_{85}) were lower. Extremes, those who were driving way over the speed limit, were reduced as well. Also those, who were driving before within the speed limit (50 km/h) that is between 46 km/h and 50 km/h are now, after the project implementation, driving slower, that is between 40 km/h and 45 km/h.



“Figure 8 – Speed monitoring (before/after)”



“Figure 9 – Speed distribution (before/after)”

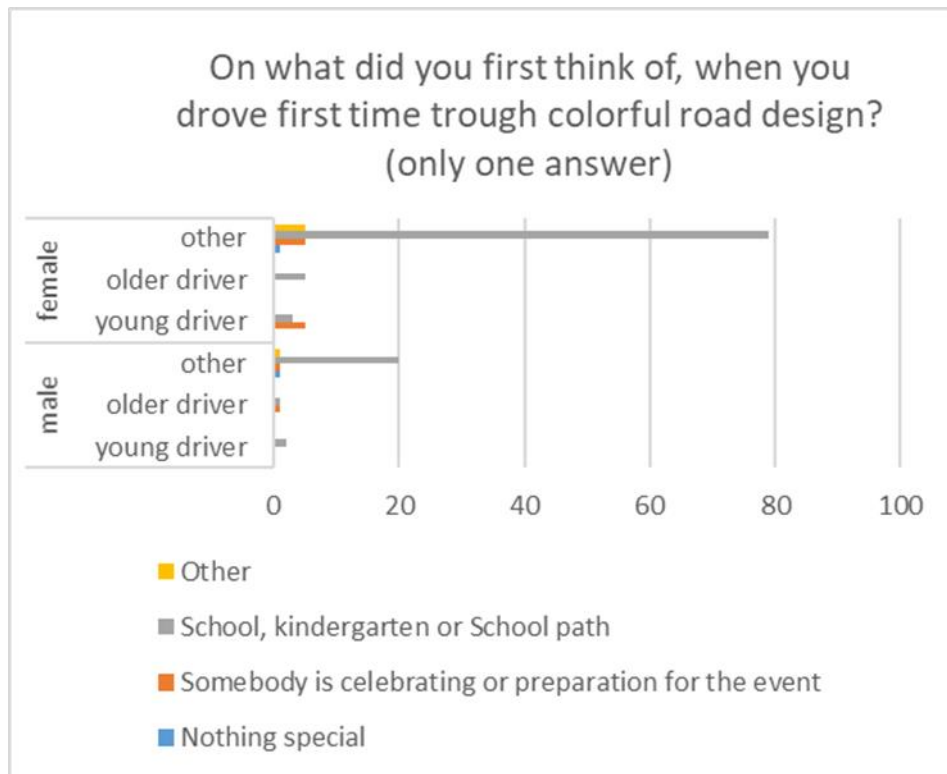
Alongside the speed monitoring, also the survey was carried out, with a desire to get answers if drivers understood the colourful road design, its purpose, and how do they re-act upon that. We wanted to know if design is enough “Self-explaining”, do drivers know, that the School is near and therefore presence of children, and do drivers become more attentive and more alert, for children presence.

The survey was carried out in the local community and 131 replies came back.

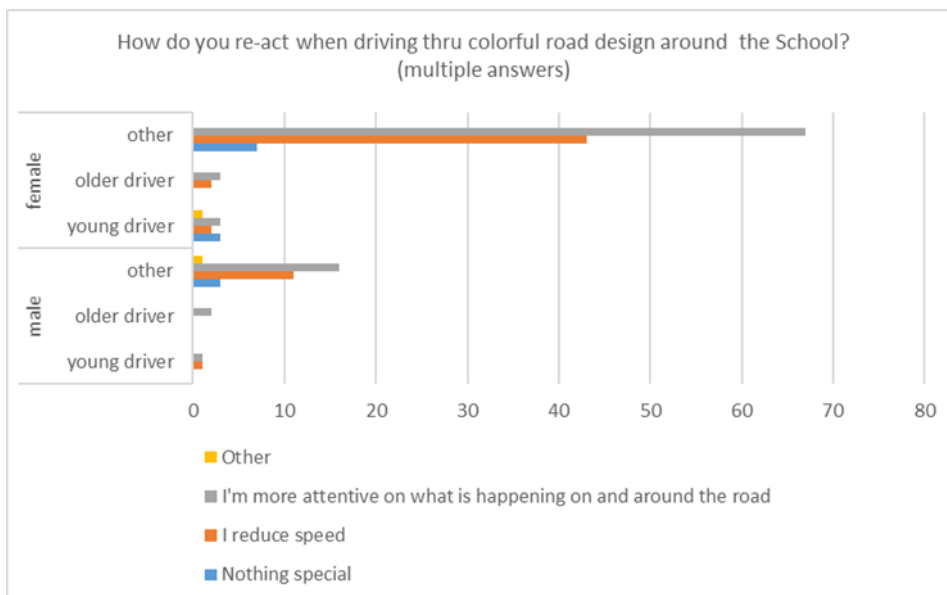
According to Slovenian regulations, the driver beginner (young driver) is driver until the age of 21 years or driver who has driving license up to 2 years, for older drivers are considered those of age more than 64 years, and in between those two categories are “other” drivers.

Looking at answers (figure 10), the colourful road design is understandable, as drivers did understand the meaning of the design and that is about School, Kindergarten and School path – presence of children. So, self-explanatory of the design was confirmed.

From answers in figure 11, we can see that self-explanatory road design has a positive effect on drivers' behaviour. They tend to be more attentive and more alert, of what is happening on or beside the road – more watchful for children and they slow down, as was also confirmed by speed monitoring.

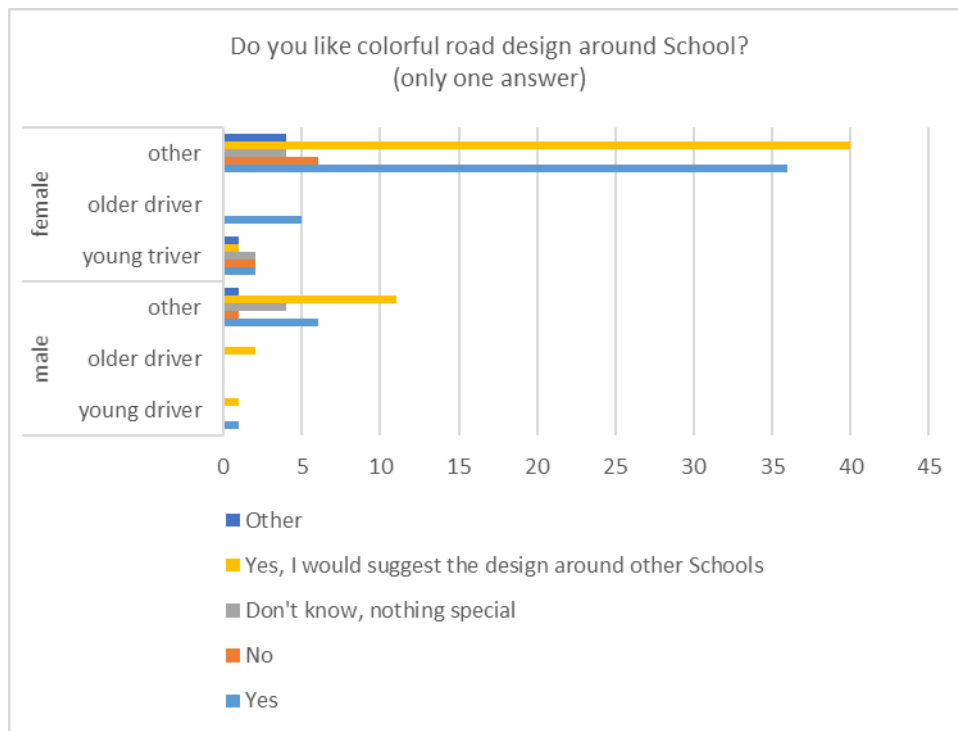


“Figure 10 – Question about “Self-Explanatory” road design”



“Figure 11 – Question regarding drivers' re-action”

Again, answers about the likability, acceptance, of the colourful road design, shown in figure 12, are positive. Drivers do like and accept it, and they recommend it, for further usage around vicinity of other Schools and Kindergartens.



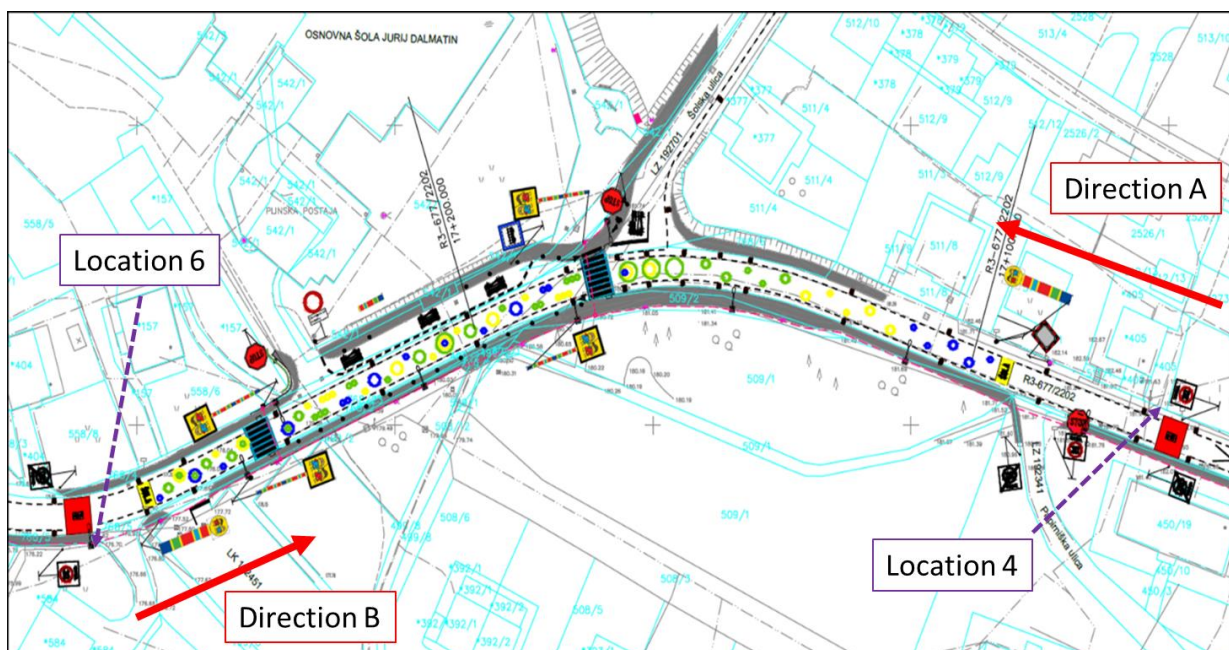
“Figure 12 – Question about likability of the colourful design”

For conclusion, we can fairly say that the project is a success and has beneficial results on driver behaviour – speed and attention.

2.2. Pilot project – state road

The object of the project (re-designing the zone 30 km/h near the School) was to implement new road design that would influence driver behaviour with lower speeds and more attentive driving and with that enhance road safety for vulnerable road users, especially for children walking and cycling to School.

With close cooperation with design engineers, Municipality Krško and Infrastructure Agency the new zone 30 km/h was designed and implemented near the School.



“Figure 13 – New (colourful) road design of zone 30”

As in previous pilot project, a lot of thoughts went in, to the preparation of the design, with emphasis on Human Factors in Road Design (several documents on the topic available in PIARC knowledge base: <https://www.piarc.org/en/knowledge-base/road-safety/Technical-Reports-Road-Safety/>).

The whole area of zone 30, was re-designed and features like Street Art and Tactical Urbanism were used, as showed in figure 14 and 15.



“Figure 14 – Implemented solution of the design (direction A)”



“Figure 15 – Implemented solution of the design (direction B)”

The overall costs for implementing the project design were around 30.500 EUR.

2.2.1 Monitoring results

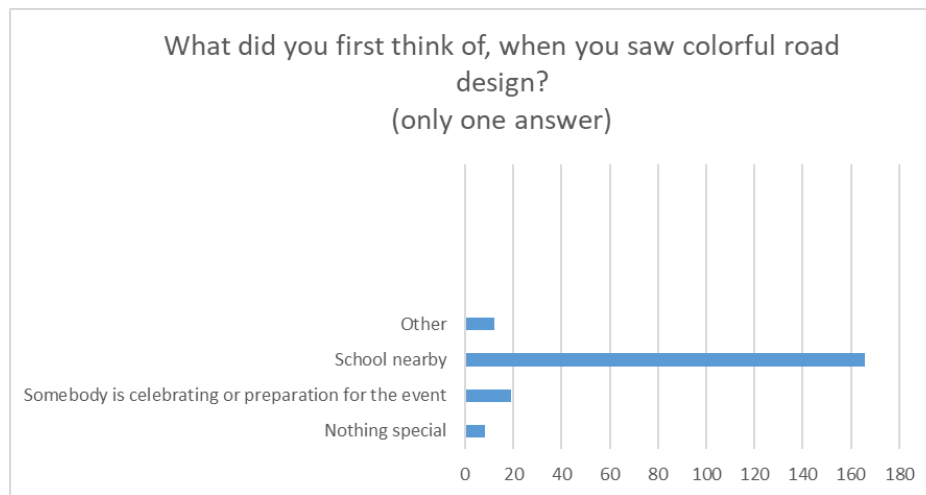
After comparison before / after speed measurements, it was found, that road design influences driver behaviour in a way, drivers reduce speed. Speed limit (zone 30) has gain its credibility. The road is Self-explaining, giving the drivers appropriate information regarding nearby School and presence of children as vulnerable road users (VRU's) on and alongside the road.

In addition, we can see in the figure 16, that speeds has reduced, also extremes, and has moved to the left in the Gauss curve. V₈₅ (85th percentile) speed (both locations) has reduced for 4 km/h and max. speed in location 4 lowered for 6 km/h and in location 6 for 17 km/h.

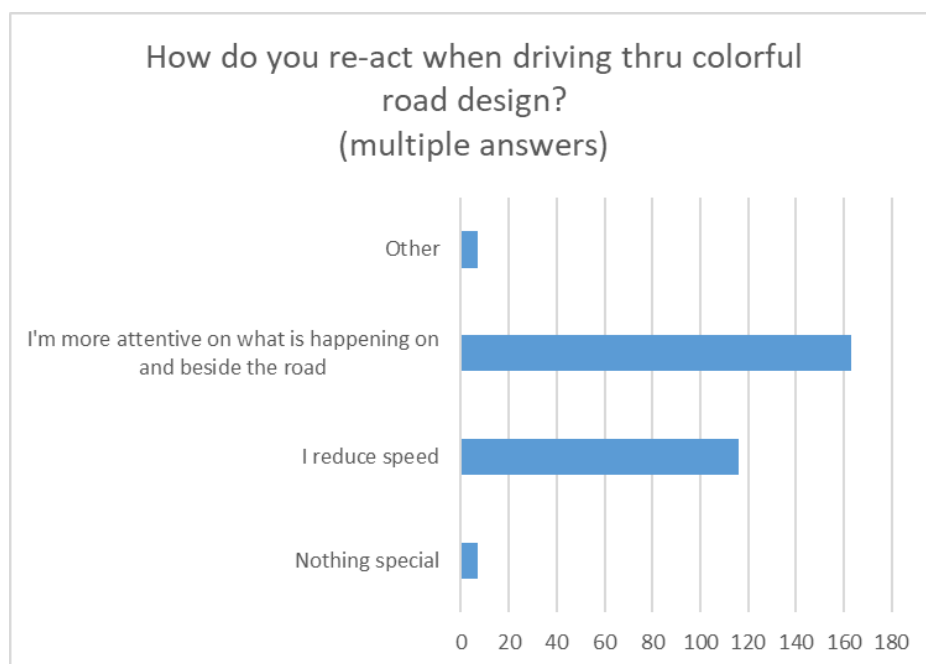


“Figure 16 – Before/after speed measurements”

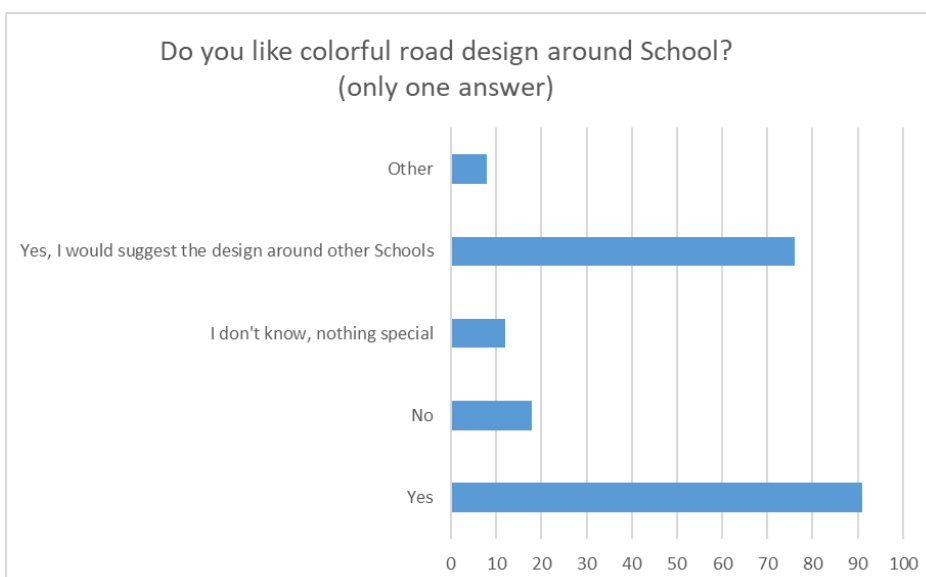
Also according to survey (205 drivers were surveyed; 61 men and 144 women) people understood road design, and did recognized it to be Self-explaining. Further drivers also tend to slow down (which was proven with the speed measurements) and are more attentive to children around the School. Furthermore, people like the road design and would recommend it for other Schools.



“Figure 17 – Question about “Self-Explanatory” road design”

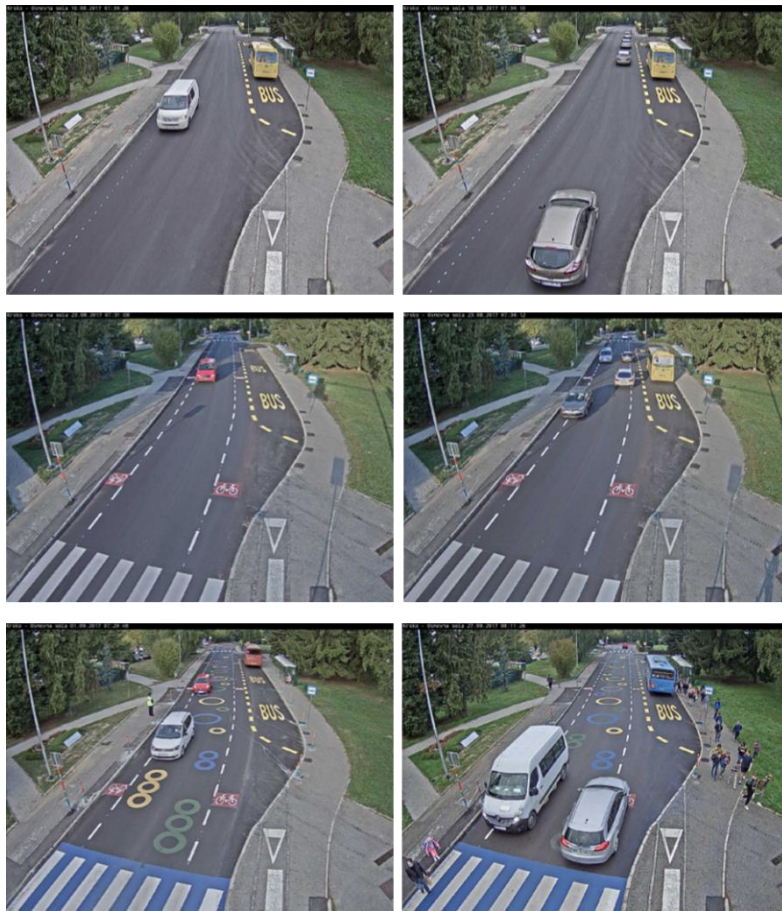


“Figure 18 – Question regarding drivers’ re-action”



“Figure 19 – Question about likability of the colourful design”

In addition, we monitored the traffic (how do drivers behave, due to colourful circles on the road); so that we would know what kind of impact do colourful circles have on drivers' behaviour and on driving, if any.



“Figure 20 – Monitoring of driving behaviour”

After evaluation of before / after implementation of colourful road design, we came to conclusion that driving trajectories of vehicles did not change due to colourful circles on the road, so they do not pose any threat to drivers while operating the vehicle.

For conclusion, we can fairly say that the project is a success and has beneficial results on driver behaviour – speed and attention. With incorporating the Human Factors in the road design, we achieved speed limits that are more credible and with that enhanced safety for VRU's.

2.3. Confirmation of hypotheses

1st hypothesis: Does the colourful road design, around Schools, has any effect on drivers to reduce the speed? **Yes**, proper road design have a positive effect on drivers around schools, and they do tend to reduce speed. What is also very important is the fact, that extreme driving (max. speeds) are almost gone.

2nd hypothesis: Do drivers in the area of colourful road design pay more attention to what is happening on or alongside the road? **Yes**, they do tend to drive more alert, as the road design tend to “wake them up” from monotone driving (so called driving in partly automated mode – not knowing when you came home).

3. THE APPROACH

After two pilot projects described above were evaluated, Ministry for Infrastructure adopted some amendments to the law. In amended Roads Act (Official Gazette of RS, No. 109/10, 48/12, 36/14, 46/15 and 10/18) in Article 21, solutions like urban equipment and architectural design of traffic areas were accepted as traffic calming measures, making this kind of solutions available for further implementation.

Upon amendment of Roads Act, Slovenian Infrastructure Agency begun to prepare a guidelines for implementing urban equipment and architectural design nearby Schools and School paths, and with that enabling safer School areas and safer travels to School. With that also promotion of walkability and sustainability will be made.

3.1. Guidelines for “Safer and Healthier to School”

In the guidelines there are, at the beginning, some general information regarding the approach (general information and the introduction). Following, we have defined the requirements of the urban equipment and architectural design (markings), regarding font type, dimensions, quality, day/night visibility, as design must be visible also in reduced visibility.



“Figure 21 – Front page with requirements for colour and retro reflectivity”

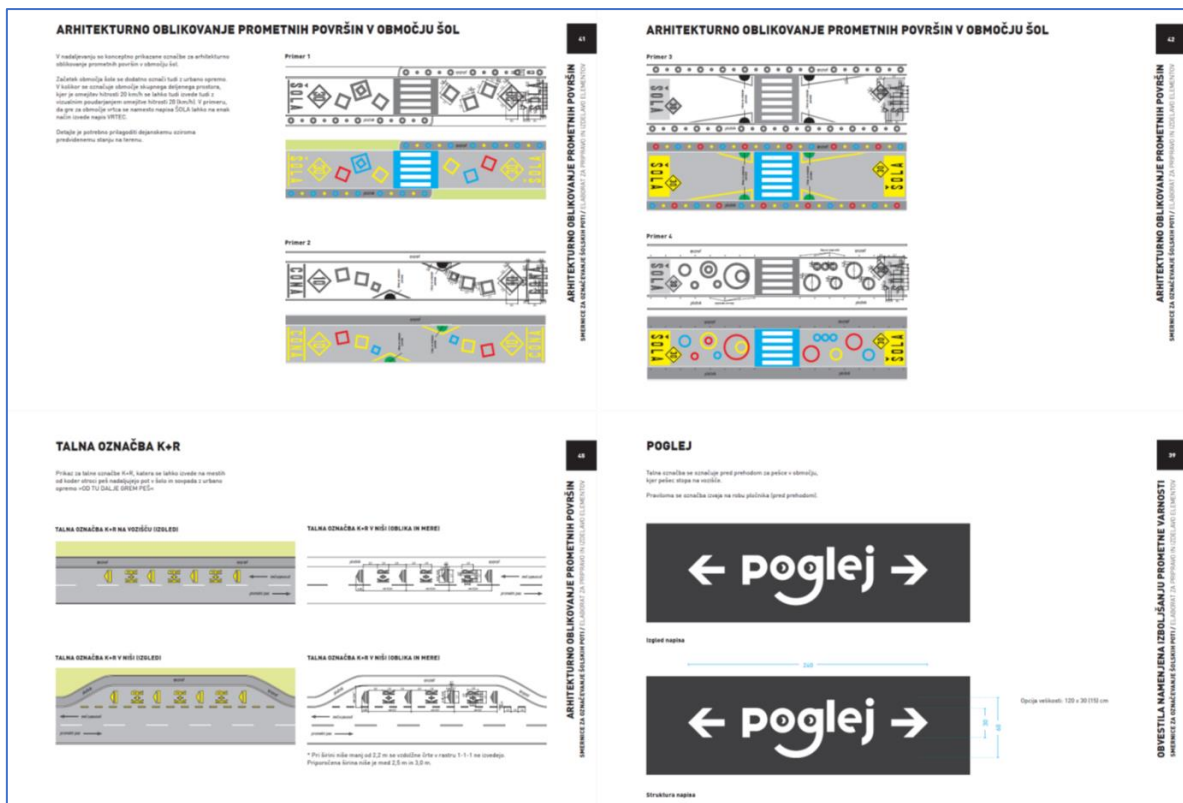
With every picture (design) there is also a short description and a recommendation, of how and when the product should be used.

It is very important that design is used in a unified way, so that drivers, no matter where in the country, will understand the information the same way, and could predict similar situation.

Among solutions are also passive safe poles (for usage outside towns), signs for Kiss and Ride system, signs for guiding Schoolchildren on bicycles, when they are doing practical bicycle exam etc. Also preventive or safety awareness messages for children are designed, like: “Stop-Look-Listen-Think”, do not use mobile phone (#ParkYourPhone), Be Seen, etc.



“Figure 22 – Different designs of urban equipment and preventive messages”



“Figure 23 – Different designs of architectural design and Kiss and Ride bays”

The whole concept is to be shortly presented on national level, especially to municipalities who are, by default, dealing with problems of School Children (Schools and School areas, School paths, School buses...).

With the guidelines, there will also be available a short video and on line based manual for usage with inter-active digital map.



“Figure 24 – Draft design of inter-active digital map for on-line use”

3.1.1 *Lessons learned*

We believe that this user friendly approach, with Self-explaining road design, will help us improve Traffic Safety situations on our roads, especially for Schoolchildren, so they can be safer, healthier and happier.

Now we know that using Human Factors knowledge in road design is very important, especially for speed management (setting credible speed limits) and for Self-explanatory road design, so that roads do “talk” to drivers.

With Self-explanatory road design, we can also tackle Drivers Distraction and Fatigue issues and of course provide better safety for all.

The most important lesson learned is: “Where there is a will, there is a way!”, meaning even if there is a legislative barrier, we have an obligation to promote and implement good practice solutions on our roads and even change legislation if needed, to achieve better safety and future for us all.

REFERENCES

1. Brumec. U. (2018). Master's thesis. Safety of Schoolchildren around School and on their way to School – managing road infrastructure while taking into account the Human Factor. Faculty of Maritime Studies and Transport. University of Ljubljana. Slovenia.
2. Roads Act (Official Gazette of RS, No. 109/10, 48/12, 36/14, 46/15 and 10/18).
3. Vaneerdewegh. P. (2009). Improving Road Safety of Vulnerable Road User on Belgian Highways. International seminar: Promoting Road Safety for Vulnerable Road Users. Capetown, South Africa. October 2009.